SB761
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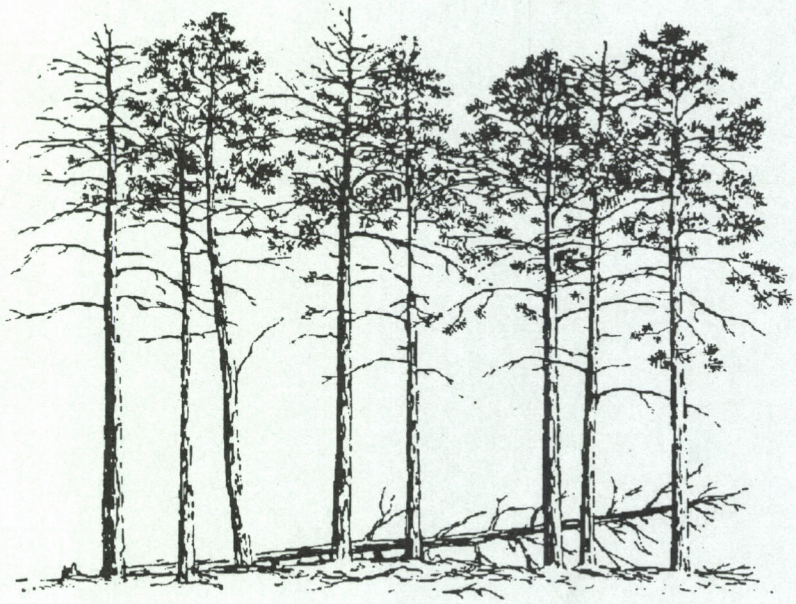
United States
Department of
Agriculture

Forest
Service

Intermountain
Region

Ogden, Utah

1996 Forest Insect and Disease Conditions



Intermountain Region

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FOREST INSECT AND DISEASE CONDITIONS

in the

Intermountain Region

1996

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INTRODUCTION

This report summarizes the status of forest insect and disease activity in the Intermountain Region (Region 4), comprising parts of Idaho, Utah, Nevada, Wyoming and California. Insect status is based largely on aerial detection surveys conducted over approximately 24,000,000 acres of forested lands in 1996. Disease status is based largely on ground observations and surveys.

General insect and disease information is summarized in the Summary of Conditions.

Numbers of trees killed by major bark beetles and affected acres are displayed in Tables 1 through 8. Acres surveyed by administrative area during 1996 are summarized in Table 9. Figure 1 depicts the number of trees killed by bark beetles in Region 4 between 1981 and 1996. Figure 2 depicts acres defoliated by Douglas-fir tussock moth and western spruce budworm in Region 4 between 1960 and 1996. Figure 3 displays the areas aerially surveyed in the Region during 1996. General location of major insect activity is shown in Figures 4 through 8.

Due to the use of more accurate ownership data, administrative areas within the survey boundary may be different than previously reported and corresponding pest information within these areas may not be comparable with previous years.

The Special Project Update summarizes on-going studies conducted by Forest Health Protection in cooperation with other Regions, Forest Service Research, and universities.

Recent publications are listed to assist the reader in locating recent pest information of interest.

SUMMARY OF CONDITIONS

Region-wide, mountain pine beetle-caused tree mortality decreased in southern Idaho, Utah, and Wyoming from 41,700 trees killed in 1995, to 29,100 trees killed in 1996. The largest outbreaks are located on the Dixie and Wasatch-Cache National Forests in Utah; and on the Targhee and Sawtooth National Forests in southern Idaho. The largest increase in mortality occurred in whitebark and limber pine. Ponderosa pine mortality increased only on the Dixie National Forest. An outbreak of mountain pine beetle and roundheaded pine beetle is occurring on the Manti-LaSal National Forest in southern Utah.

Jeffrey pine beetle continues to kill large old growth and second growth Jeffrey pine on the Toiyabe National Forest. Mortality has decreased, but remains locally significant in the Tahoe Basin.

Spruce beetle mapped-mortality increased approximately three-fold in 1996. Region-wide, 82,500 dead trees were recorded in 1996 compared to 28,100 in 1995. No significant mortality was recorded in southern Idaho or western Wyoming. In Utah, mortality increased on all National Forests except the Ashley. The largest increases in recorded mortality are occurring on the Dixie and Manti-LaSal National Forests. Populations on these two forests still remain at epidemic levels.

Douglas-fir mortality, caused by Douglas-fir beetle infestation, increased from previous levels with 62,675 trees killed in 1996 compared to 48,500 trees in 1995. Decreases in mortality occurred in Utah and western Wyoming, while mortality increased in Idaho. The largest outbreaks are located on the Boise, Salmon, Payette, and Sawtooth National Forests in Idaho; and on the Manti-LaSal and Ashley National Forests in Utah.

Western pine beetle mortality decreased from 8,900 trees killed in 1995, to 4,300 trees in 1996. Mortality is located primarily on the Boise and Payette National Forests in southern Idaho. Pine engraver beetle activity was frequently associated with western pine beetle infestation.

A complex of western balsam bark beetle, twig beetle, secondary bark beetle, wood borer, engraver beetle, environmental conditions, and disease pathogens continues to damage and kill subalpine fir throughout the Region. Mortality levels decreased in 1996 with 121,175 dying trees observed, while in 1995, 418,800 trees were killed. Mortality throughout the host type affects trees of all size classes.

Fir engraver beetle mortality decreased in Idaho, Nevada, and Utah. Region-wide, 46,400 true fir trees were killed in 1996 compared to 170,400 trees in 1995. Much of this decrease is attributed to a decline in activity on the Manti-LaSal and Uinta National Forests in Utah, and the Toiyabe National Forest in Nevada. Large outbreaks are still located on the Toiyabe National Forest in Nevada, and the Manti-LaSal and Uinta National Forests in Utah.

Foliage diseases of *Populus* species were epidemic again in 1996, probably because of prolonged cool, moist weather extending into late June. Defoliation by the fungus *Marssonina* was common throughout Utah and southern Idaho.

In eastern Idaho, cedar apple rust, caused by an undetermined species of *Gymnosporangium*, caused a leaf spot on residential apple trees in Challis and Salmon, and to *Amelanchier* throughout the range of serviceberry in eastern Idaho for the second year in a row..

Gambel oak along the Wasatch Front in northern Utah has suffered notable defoliation caused by fall cankerworm and the Gamble oak looper for the third year in a row. No other significant defoliator activity was observed in 1996.

Status of Insects

Cooley spruce gall adelgid

Adelges cooleyi
Location: Idaho, Utah, Wyoming
Host: Spruce

This adelgid was found in forested stands and ornamental trees throughout the Region; impact is greatest on ornamental trees.

Douglas-fir beetle

Dendroctonus pseudotsugae
Location: Idaho, Utah
Host: Douglas-fir

Regionwide mortality increased, with 62,675 trees killed in 1996. Outbreaks were located on the Sawtooth, Boise, Salmon, and Payette National Forests in southern Idaho. In Utah, tree mortality decreased with 8,600 trees killed in 1996 and 11,500 trees killed in 1995. The largest outbreaks are located on the Manti-LaSal, and Ashley National Forests. Smaller outbreaks are located on other National Forests in Utah. Mortality on the Bridger-Teton National Forest in western Wyoming decreased from 2,000 trees in 1995 to 1,500 trees in 1996.

Douglas-fir tussock moth

Orgyia pseudotsugata
Location: Idaho, Nevada, Utah
Host: Douglas-fir, True firs

No defoliation was observed in 1996.

European gypsy moth

Lymantria dispar
Location: Idaho, Nevada, Utah
Host: Various deciduous species

Seven moths were caught in Salt Lake county, Utah. All moths were captured in the foothills of areas previously treated during the 1989-93 eradication project. A delimitation and mass trapping program will be undertaken in the summer of 1997. Four moths were caught in Nevada where a delimitation program is also planned. For the first year since the trapping program in Idaho began in 1986, no moths were caught during 1996. Detection trapping will continue throughout the Region.

Fall cankerworm/Gamble oak looper

Alsophila pometaria/Lambdina punctata
Location: Utah
Host: Gamble oak

Extensive defoliation of Gamble oak was recorded along the Wasatch Front in the spring of 1996. Larvae were found in conjunction with Fall Cankerworm populations. Defoliation was observed in pockets consisting of 1-50 acres.

Fir engraver beetle

Scolytus ventralis
Location: California, Idaho, Nevada, Utah
Host: Grand fir, Red fir, Subalpine fir, White fir

Regionwide mortality decreased 65 percent with 46,400 trees killed in 1996 compared to 133,400 trees in 1995. Only 200 trees were killed in southern Idaho in 1996 compared to 400 trees in 1995. Fir engraver beetle activity in Utah also decreased with 12,300 trees killed in 1996 compared to 78,800 trees killed in 1995. Most activity was located on the Uinta and Manti-LaSal National Forests where 2,300 and 3,500 dead trees, respectively, were observed. Mortality was also observed on

the Dixie, Fishlake, and Wasatch-Cache National Forests. In the areas surveyed in Nevada, activity decreased from 61,200 trees killed in 1995 to 37,100 in 1996. Mortality is located primarily on Federal, State, and private lands in the Tahoe Basin area and adjacent areas of the Toiyabe National Forest.

Jeffrey pine beetle

Dendroctonus jefferyi
Location: California, Nevada
Host: Jeffrey pine

Jeffrey pine beetle activity declined on the Toiyabe National Forest with 4,100 trees killed in 1996. Scattered tree mortality continues to occur in the Tahoe Basin area and other areas on the Toiyabe National Forest.

Larch casebearer

Coleophora laricella
Location: Idaho
Host: Western larch

Western larch growing in McCall and Cascade, Idaho, were defoliated by the larvae of this exotic moth. Defoliation was concentrated in residential areas and did not extend into generally forested areas.

Mountain pine beetle

Dendroctonus ponderosae
Location: Idaho, Nevada,Utah, Wyoming
Host: Limber, Lodgepole, Jeffrey, Ponderosa, Whitebark pines

Mountain pine beetle-caused mortality decreased from 41,700 in 1995 to 29,100 trees in 1996. In Utah, 17,300 trees were killed during 1996, opposed to 25,500 trees in 1995. Ponderosa pine was the primary host. The largest outbreak is located on the Dixie National Forest where 8,500 trees were killed. Smaller outbreaks were located on most other National Forests in Utah. In Idaho, mortality decreased with 11,400 trees killed in 1996 compared to 14,400 trees in 1995. Mortality occurred in both lodgepole and ponderosa pine. Decreases occurred on most National Forests in the Region. The largest outbreak in southern Idaho is located on the Targhee National Forest.

Mortality of whitebark and limber pine attributed to mountain pine beetle infestation continued to increase in 1996. Small, isolated infestations are located on National Forests in Idaho, Utah, and on the Bridger-Teton National Forest in western Wyoming. Larger outbreaks are located on the Manti-LaSal National Forest in Utah, and the Targhee National Forest in Idaho.

Pine engraver beetle

Ips pini
Location: Idaho, Nevada, Utah
Host: Lodgepole, Ponderosa pine

Mortality due to pine engraver beetle remained static throughout the Region. Activity is often associated with western pine beetle. In Utah, populations were found in slash of ponderosa and lodgepole pine.

Poplar-and-willow borer
Cryptorhynchus lapathi
Location: Idaho
Host: Willow

The larvae of this weevil are defoliating and causing stem mortality of Scouler willow on the west side of the Grand Teton Range in extreme southeastern Idaho.

Roundheaded pine beetle
Dendroctonus adjunctus
Location: Utah
Host: Ponderosa pine

Ponderosa pine mortality is being caused by this beetle on the Pine Valley Ranger District, Dixie National Forest; and along the Abajo Mountains on the Monticello Ranger District, Manti-LaSal National Forest..

Sagebrush leaf beetle
Trirhabda sp.
Location: Idaho
Host: Sagebrush

Heavy defoliation of sagebrush caused by a leaf beetle was detected on rangeland south of Twin Falls, Idaho.

Sequoia pitch moth
Synanthedon sequoiae
Location: Nevada
Host: Lodgepole, Ponderosa pine

Localized populations are found on the east side of the Sierras, on the Toiyabe National Forest. Populations are heavy, affecting ornamental Jeffrey pine in Carson City, Nevada.

Spruce beetle
Dendroctonus rufipennis
Location: Idaho, Utah, Wyoming
Host: Spruce

Spruce beetle mortality increased approximately three-fold during 1996 with 82,500 trees recorded compared to 28,100 in 1995. No significant mortality was reported on any Forests in southern Idaho. In Utah where 81,400 trees were recorded, mortality increased on all National Forests except the Ashley. Mortality was heaviest on the Dixie, Fishlake, and Manti-LaSal National Forests. No significant mortality was observed on the Bridger-Teton National Forest in western Wyoming.

Subalpine fir mortality complex
Dryocetes confusus, Pityophthorus sp., Pityokeines sp., Crypturgus sp., Scolytus sp., Heterobasidion annosus, Armillaria sp., Cytospora abietis, Melampsporella caryophyllacearum
Location: Idaho, Utah, Wyoming
Host: Subalpine fir

During the years 1988-1994, subalpine fir mortality in Region 4 had been mostly attributed to the western balsam bark beetle (*Dryocetes confusus*). However, ground examinations in 1995 suggest a complex of factors are involved in this mortality. These factors include: twig beetles, secondary bark beetles, wood borers, engraver beetles, root diseases, cankers, rusts, and environmental conditions.

This complex has resulted in the death of 121,175 trees throughout the Region during 1996. Even though this mortality complex is the most widespread cause of visible mortality in the Region, it is declining. In

Idaho, 38,200 trees were killed during 1996 compared to 78,000 trees in 1995. Large areas of mortality are located on all forests in southern Idaho. In Utah, activity decreased with only 52,500 trees killed in 1996. Mortality was observed on every forest in Utah. Activity also decreased in western Wyoming with 54,000 trees killed in 1996 compared to 72,300 trees in 1995.

Western pine beetle

Dendroctonus brevicomis
Location: Idaho
Host: Ponderosa pine

Western pine beetle activity decreased on the Boise, Payette, and Sawtooth National Forests in southern Idaho. Approximately 4,300 trees were killed in 1996 compared to 8,900 in 1995. Pine engraver beetle activity was frequently associated with western pine beetle infestation.

Western spruce budworm

Choristoneura occidentalis
Location: Idaho, Utah, Wyoming
Host: Douglas-fir, True firs

No visible defoliation from spruce budworm was observed in the Region during 1996.

Status of Stem and Branch Diseases

Abiotic

Location: Idaho
Host: All vegetation

Temperatures as low as 19 degrees F on the nights of June 18-20 resulted in leader and branch tip mortality to tender new growth throughout central and eastern Idaho.

Aspen trunk rot

Phellinus tremulae
Location: Idaho, Nevada, Utah, Wyoming
Host: Aspen

Decay occurs in most aspen stands in the Region and is increasingly common as aspen stands exceed 80 years of age.

Comandra blister rust

Cronartium comandrae
Location: Idaho, Utah, Wyoming
Host: Lodgepole, Ponderosa pine

Infection occurs infrequently throughout Idaho and Utah. Heavy, localized areas of infection resulting in branch, top, and entire tree mortality of sapling-size ponderosa pines occurs in southern Idaho. In Wyoming and northern Utah, infection frequently occurs on lodgepole pine in localized pockets.

Cytospora canker of true firs

Cytospora abietis
Location: Idaho, Utah, Nevada, Wyoming
Host: True firs

Branch flagging, top-killing, and mortality attributed to this fungus occurs wherever host is found. This disease is associated with environmental stress damage. Western balsam bark beetle frequently kills the diseased trees.

Dwarf mistletoes

Arceuthobium sp.
Host: Douglas-fir, Pines, Western Larch
Location: Idaho, Nevada, Utah, Wyoming

Suppression projects continue to remove infected overstory trees; however this forest disease remains the most widespread and frequently observed disease within the Intermountain Region. Regional incidence by major host species is estimated as follows: lodgepole pine - 50 percent infected, ponderosa pine - 20 percent infected, and Douglas-fir - 20 percent infected. These numbers represent the percentage of host stands sharing some level of infection.

Limb rust

Peridermium filamentosum
Location: Utah
Host: Ponderosa pine

Infection causing branch mortality and occasional tree mortality occurs in all size classes of trees on the Dixie National Forest in southern Utah.

Other stem decays

Cryptoporus volvatus, Fomitopsis officinalis, Laetiporus sulphureus
Location: Idaho, Nevada, Utah, Wyoming
Host: Various conifers

A large number of minor stem decay agents, too numerous to list, occur with varying intensity throughout the Region.

Pinyon blister rust

Cronartium occidentale
Location: Idaho, Utah
Host: Pinyon pine

This disease occurs in the Raft River Mountains on the Sawtooth National Forest, Idaho.

Red ring rot

Phellinus pini
Location: Idaho, Utah, Wyoming
Host: Douglas-fir, Pines, Spruce, Western Larch

Infection intensity varies throughout host stands in the Region.

Rust-red stringy rot

Echinodontium tinctorium
Location: Idaho, Nevada, Utah
Host: Grand fir, Subalpine fir, White fir

Decay caused by this fungus is common in mature and overmature stands of true firs throughout the region.

Stalactiform blister rust
Cronartium coleosporiodes
Location: Idaho, Nevada, Utah
Host: Lodgepole pine

This rust occurs in localized areas throughout the host type. Heavy infection has been noted in very localized areas on the Boise, Payette, Sawtooth, and Challis National Forests in Idaho.

True mistletoe on juniper
Phoradendron juniperinum
Location: Nevada, Utah
Host: Junipers

Occurring throughout the pinyon-juniper forest type in Utah and Nevada, this disease spreads and intensifies slowly and is therefore more common in older stands.

Western gall rust
Endocronartium harknessii
Location: Idaho, Utah, Wyoming
Host: Lodgepole, Ponderosa pine

Gall rust occurs throughout the host types. Infection levels vary, with localized heavy infection present in both host species.

White pine blister rust
Cronartium ribicola
Location: Idaho, Nevada
Host: Limber, Whitebark pine

A formal survey of five-needled pines was conducted in 1995-1996 to quantify disease incidence and intensity, and determine site and stand characteristics of infected areas. An interim report is forthcoming.

Status of Root Diseases

Annosus root disease
Heterobasidion annosum
Location: California, Idaho, Nevada, Utah, Wyoming
Host: Bitterbrush, Chokecherry, Douglas-fir, Jeffrey pine, Lodgepole pine, Ponderosa pine, Spruce, True firs

This root disease fungus can be found throughout the Region, but mostly as a decay organism. The fungus is occasionally damaging to young, planted stands of ponderosa pine on droughty soils.

Armillaria root disease
Armillaria spp.
Location: Idaho, Nevada, Utah, Wyoming
Host: Douglas-fir, Grand fir, Pines, Spruce, Subalpine fir

Evidence of Armillaria root disease can be found throughout the Region functioning primarily as a weak pathogen or saprophyte causing little direct mortality. In southern Utah, it may act as a primary pathogen, killing mature and immature ponderosa pine and mature fir and spruce.

Black stain root disease

Ophiostoma wageneri
Location: Idaho, Nevada, Utah
Host: Pinyon pine

This fungus causes mortality of pinyon pine on the Bureau of Land Management Burley District in Idaho, on the Humboldt and Toiyabe National Forests in Nevada, and on the Dixie and Manti-LaSal National Forests in Utah.

Schweinitzii butt rot

Phaeolus schweinitzii
Location: Idaho
Host: Douglas-fir, Ponderosa pine

Decay is common in mature and overmature forests throughout the host type, especially those with a frequent fire or logging history. The fungus is often associated with other root pathogens and bark beetle activity. Trees are seldom killed directly as a result of infection.

Tomentosus root disease

Inonotus tomentosus
Location: Idaho, Utah
Host: Douglas-fir, Spruce, Subalpine fir

This fungus is found alone or associated with *Phaeolus schweinitzii* and *Armillaria* spp. It causes root and butt rot of pole-sized and larger trees, predisposing them to bark beetle attack and windthrow. In southern Utah, it kills spruce in progressively enlarging disease centers.

White mottled rot

Ganoderma applanatum
Location: Idaho, Nevada, Utah, Wyoming
Host: Aspen

This pathogen is increasing in incidence throughout the Region. The disease can be found on windthrown aspen on the Dixie, Wasatch-Cache, and Fishlake National Forests in Utah; Humboldt National Forest in Nevada; and Caribou and Sawtooth National Forests in Idaho.

Status of Nursery Diseases

Fusarium root disease

Fusarium oxysporum
Location: Idaho, Utah
Host: Douglas-fir, Ponderosa pine, Spruce, True firs

This disease causes small amounts of mortality primarily of 1-0 conifer seedlings at the Lucky Peak Nursery in Idaho and the Lone Peak Nursery in Utah.

Phytophthora/Pythium root rot

Phytophthora spp., *Pythium* spp.
Location: Idaho, Utah
Host: Douglas-fir, Spruce

These fungi occur infrequently on seedlings and in soil at the Lucky Peak Nursery in Idaho, and the Lone Peak Nursery in Utah. Infection results in patch mortality and culling of 2-0 seedlings.

Status of Foliage Diseases

Cedar apple rust
Gymnosporangium sp.
Location: Idaho
Host: Apple, Serviceberry

In eastern Idaho, this disease caused by an unknown species of *Gymnosporangium*, caused a leaf spot on residential apple trees in Challis and Salmon, and to *Amelanchier* throughout the range of serviceberry in eastern Idaho.

Conifer - Aspen rust, Conifer - Cottonwood rust
Melampsora medusae, Melampsora occidentalis
Location: Idaho
Host: Aspen, Conifers, Cottonwood

Endemic throughout the host range of all *Populus* species.

Douglas-fir needle cast
Rhabdocline spp.
Location: Idaho, Wyoming
Host: Douglas-fir

Incidence was light with infection noted throughout the range of Douglas-fir in southwestern Idaho. Heavy infection levels were observed on the Targhee and Bridger-Teton National Forests.

Elytroderma disease
Elytroderma deformans
Location: Idaho
Host: Ponderosa pine

Systemic and annual infections occur throughout the host type. Infection was especially severe on the Salmon National Forest where foliage discoloration was noted on over 9,500 acres.

Fir broom rust
Melampsorella caryophyllacearum
Location: Idaho, Nevada, Utah, Wyoming
Host: Subalpine fir

Infections occur throughout the host's range. Infection intensity varies significantly, but is common in stands south of the Snake River in Idaho.

Fir needle cast
Lirula spp.
Location: Idaho
Host: Grand fir, Subalpine fir

Infection is at endemic levels throughout the host type.

Fir needle rust
Pucciniastrum epilobii
Location: Idaho, Wyoming
Host: Subalpine fir

Scattered infection occurs on seedling and sapling size trees throughout the host type.

Incense cedar broom rust
Gymnosporangium libocedri
Location: California, Nevada
Host: Incense cedar

This disease occurs in isolated patches of host trees on the Toiyabe National Forest.

Larch needle diseases
Meria laricis, Hypodermella laricis
Location: Idaho
Host: Western larch

Incidence and severity of infection in west central Idaho is cyclical. In 1996, these diseases were epidemic over the host range following a late frost in June. Over 88,000 acres of damage was found on the Payette and northern Boise National Forests

Lodgepole pine needle cast
Lophodermella concolor
Location: Idaho
Host: Lodgepole pine

Infection intensity is worse following periods of drought. During intervening years, the disease is of minor localized importance.

Marssonina blight
Marssonina populi
Location: Idaho, Utah, Wyoming
Host: Aspen

The disease was epidemic in 1996 in central and eastern Idaho and northern Utah. Affected trees had brown colored foliage from mid-July until leaf drop.

Pine needle rust
Colesporium spp.
Location: Idaho
Host: Lodgepole, Ponderosa pine

Scattered incidence of light to moderate intensity occurred scattered throughout the host types in southern Idaho.

Spruce broom rust
Chrysomyxa arctostaphylii
Location: Idaho, Utah, Nevada, Wyoming
Host: Englemann spruce

Scattered infections occurred throughout the host type, especially in eastern Idaho and in localized pockets on the Fishlake National Forest, Utah.

TABLE 1. *Number of trees killed and acres affected by bark beetles on National Forests of Region 4 during 1996 as determined by aerial detection surveys.*

	Mountain Pine Beetle		Douglas-fir Beetle		Western pine Beetle/Ips		Spruce Beetle		Fir Engraver Beetle		Subalpine fir Mortality Complex		Jeffrey Pine Beetle		**Totals**	
Forest*	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres	Trees	Acres
Ashley	700	500	2,400	1,300	0	0	0	0	0	0	6,100	39,400	0	0	9,200	41,200
Boise	1,000	400	7,500	17,500	2,100	1,600	100	100	0	0	2,700	1,900	0	0	13,400	21,500
Bridger-Teton	400	200	1,500	900	0	0	0	0	0	0	48,500	39,400	0	0	50,400	40,500
Caribou	200	1,200	1,300	1,100	0	0	0	0	0	0	6,400	6,500	0	0	7,900	8,800
Challis	1,300	200	3100	5,200	0	0	0	0	0	0	2,000	600	0	0	6,400	6,000
Dixie	8,500	17,700	350	200	0	0	24,200	7,400	1,200	700	13,600	7,700	0	0	47,850	33,700
Fishlake	1,400	900	0	0	0	0	6,500	2,700	1,300	1,000	1,800	1,500	0	0	11,000	6,100
Manti-LaSal	2,700	2,800	2,600	2,300	0	0	47,800	22,900	3,500	3,900	2,600	2,100	0	0	59,200	34,000
Payette	400	300	7,100	12,300	800	1,200	600	400	0	0	200	200	0	0	9,100	14,400
Salmon	1,000	700	7,100	4,300	0	0	400	200	0	0	500	400	0	0	9,000	5,600
Sawtooth	2,200	2,000	26,800	28,500	0	0	0	0	0	0	16,400	12,500	0	0	45,400	43,000
Targhee	4,900	2,400	600	200	0	0	0	0	0	0	1,300	400	0	0	6,800	3,000
Toiyabe	0	0	0	0	0	0	0	0	37,100	25,100	0	0	4,100	2,900	41,200	28,000
Uinta	100	100	1,125	700	0	0	150	100	2,300	3,800	3,475	2,800	0	0	7,150	7,500
Wasatch-Cache	3,000	1,400	1,200	700	0	0	500	300	1,000	700	15,600	7,100	0	0	21,300	10,200
TOTAL	27,800	30,800	62,675	75,200	2,900	2,800	80,250	34,100	46,400	35,200	121,175	122,500	4,100	2,900	345,300	303,500

*Does not include all BLM, Tribes of the Indian Nations, and State and Private lands adjacent to Forests.

TABLE 2. *Status of mountain pine beetle infestations by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	7.2	11.0
	Other Federal	0.0	0.0
	State and Private	0.4	0.4
Idaho Total		**7.6**	**11.4**
Utah	National Forest	23.4	16.4
	Other Federal	0.1	0.2
	State and Private	1.1	0.7
Utah Total		**24.6**	**17.3**
Wyoming	National Forest	0.2	0.4
	Other Federal	0.0	0.0
	State and Private	0.0	0.0
Wyoming Total		**0.2**	**0.4**
Grand Total		**32.4**	**29.1**

TABLE 3. *Status of spruce beetle infestations by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	0.7	1.1
	Other Federal	0.0	0.0
	State and Private	0.0	0.0
Idaho Total		**0.7**	**1.1**
Utah	National Forest	33.4	79.2
	Other Federal	0.0	0.0
	State and Private	1.0	2.2
Utah Total		**34.4**	**81.4**
Grand Total		**35.1**	**82.5**

TABLE 4. *Status of Douglas-fir beetle infestations by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	69.1	53.5
	Other Federal	4.1	2.7
	State and Private	1.8	1.8
Idaho Total		**75.0**	**58.0**
Utah	National Forest	5.2	7.7
	Other Federal	0.1	0.1
	State and Private	0.5	0.8
Utah Total		**5.8**	**8.6**
Wyoming	National Forest	0.9	1.5
	Other Federal	0.0	0.0
	State and Private	0.0	0.0
Wyoming Total		**0.9**	**1.5**
Grand Total		**81.7**	**68.1**

TABLE 5. *Status of western pine beetle/Ips beetle infestations by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	2.8	2.9
	Other Federal	0.1	0.1
	State and Private	0.8	1.3
Idaho Total		**3.7**	**4.3**
Grand Total		**3.7**	**4.3**

TABLE 6. *Status of Jeffrey pine beetle infestations by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Nevada	National Forest	2.9	4.1
	Other Federal	0.0	0.0
	State and Private	0.3	0.5
Nevada Total		**3.2**	**4.6**
Grand Total		**3.2**	**4.6**

TABLE 7. *Status of subalpine fir mortality complex by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	22.5	29.5
	Other Federal	4.0	3.2
	State and Private	7.6	5.5
Idaho Total		**34.1**	**38.2**
Utah	National Forest	60.6	43.2
	Other Federal	0.1	0.1
	State and Private	4.5	9.2
Utah Total		**65.2**	**52.5**
Wyoming	National Forest	39.4	48.5
	Other Federal	3.2	4.1
	State and Private	0.7	1.4
Wyoming Total		**43.3**	**54.0**
Grand Total		**142.6**	**144.7**

TABLE 8. *Status of fir engraver beetle infestations by state during 1996.*

State	Land Ownership Class	Outbreak Area (Thousand Acres)	Number of Trees (Thousands)
Idaho	National Forest	0.0	0.0
	Other Federal	0.0	0.0
	State and Private	0.1	0.2
Idaho Total		**0.1**	**0.2**
Utah	National Forest	10.1	9.3
	Other Federal	0.0	0.0
	State and Private	2.1	3.0
Utah Total		**12.2**	**12.3**
Nevada	National Forest	22.7	35.1
	Other Federal	0.4	0.5
	State and Private	2.0	1.5
Nevada Total		**25.1**	**37.1**
Grand Total		**37.6**	**49.9**

TABLE 9. *Number of acres aerially surveyed by administrative area during 1996.*

Administrative Area	Acres Surveyed (Thousands)
Ashley National Forest	1,593.8
Boise National Forest	2,028.3
Bridger-Teton National Forest	2,400.9
Bryce Canyon National Park	18.2
Bureau of Land Management	705.2
Caribou National Forest	958.1
Cedar Breaks National Monument	6.0
Challis National Forest	1,432.3
Dixie National Forest	1,576.5
Fishlake National Forest	454.2
Fort Hall Indian Reservation	40.4
Glen Canyon National Park	48.5
Grand Teton National Park	0.1
Payette National Forest	2,268.5
Manti-LaSal National Forest	1,388.2
Salmon National Forest	1,728.0
Sawtooth National Forest	1,717.0
State and Private Lands, Idaho	1,546.1
State and Private Lands, Nevada	58.2
State and Private Lands, Utah	1,303.3
State and Private Lands, Wyoming	56.7
Targhee National Forest	1,193.3
Toiyabe National Forest	718.2
Uinta National Forest	446.5
Wasatch-Cache National Forest	730.4
Grand Total	**24,467.3**

Figure 1.

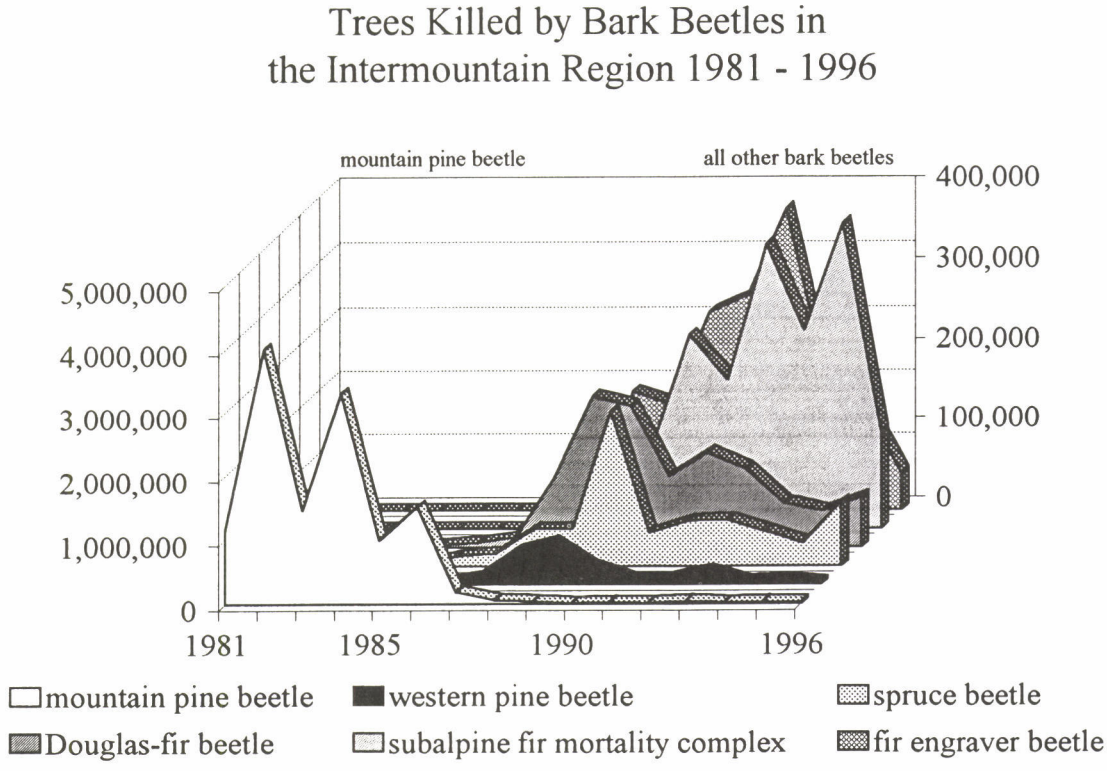


Figure 2.

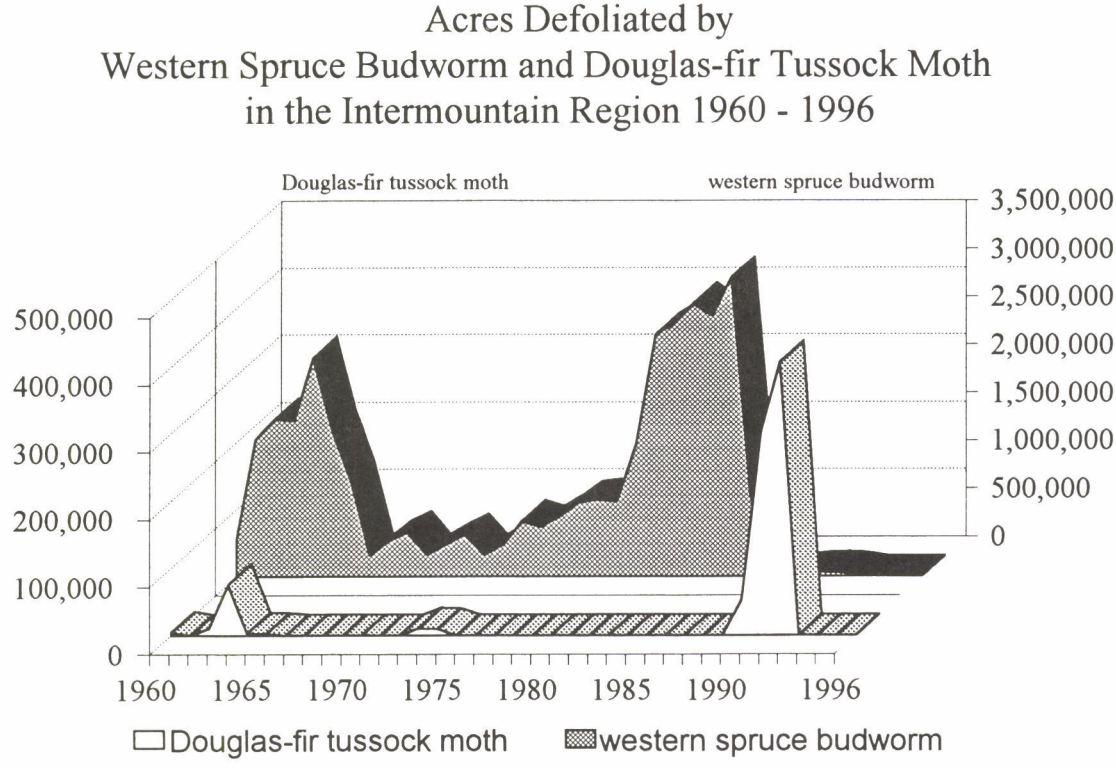


FIGURE 3. *Tree mortality associated with mountain pine beetle and Jeffrey pine beetle in Region 4 - 1996 aerial detection surveys.*

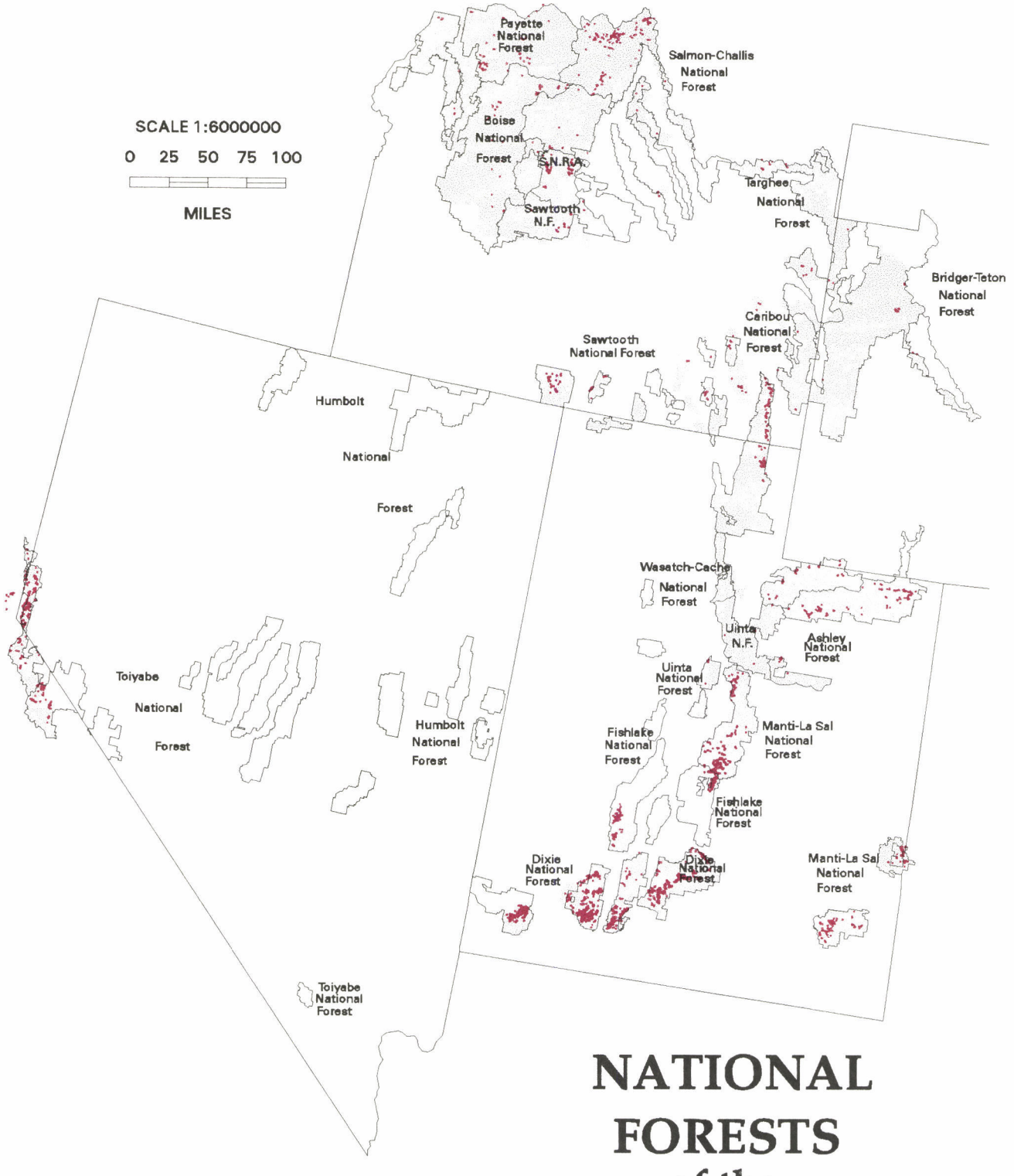
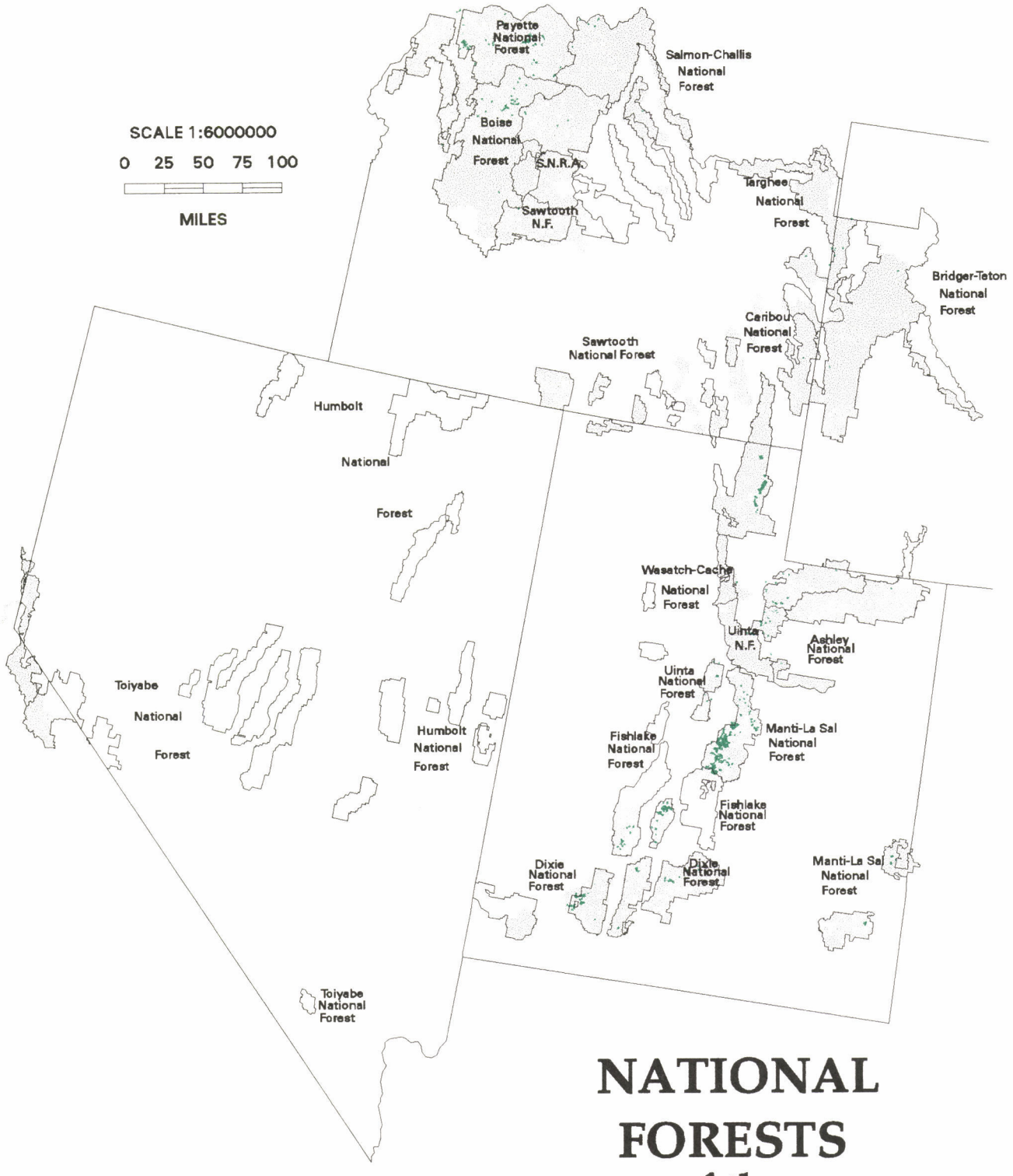


FIGURE 4. *Tree mortality associated with spruce beetle in Region 4 - 1996 aerial detection surveys.*



NATIONAL FORESTS of the INTERMOUNTAIN REGION

FIGURE 5. *Tree mortality associated with Douglas-fir beetle in Region 4 - 1996 aerial detection surveys.*

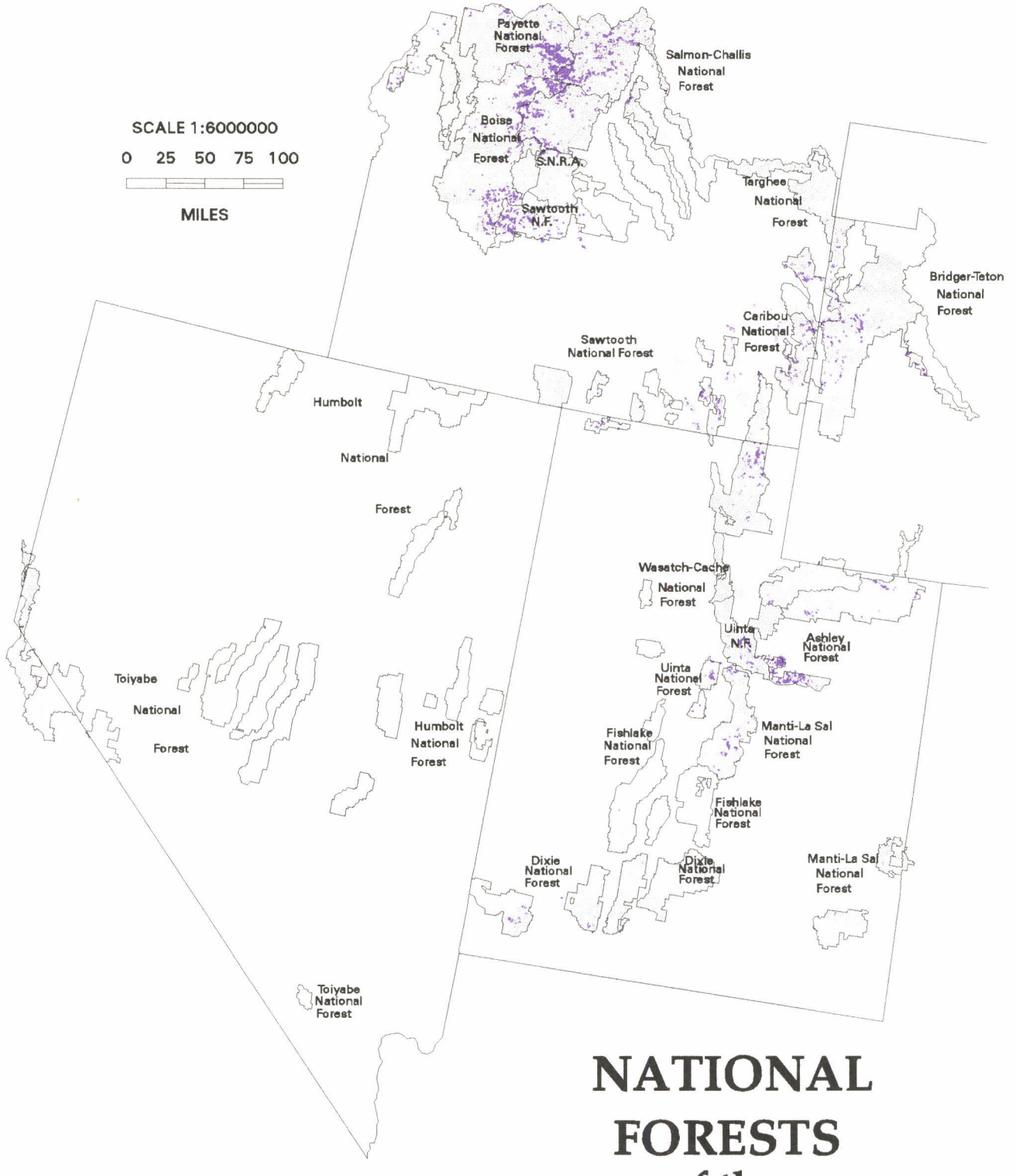
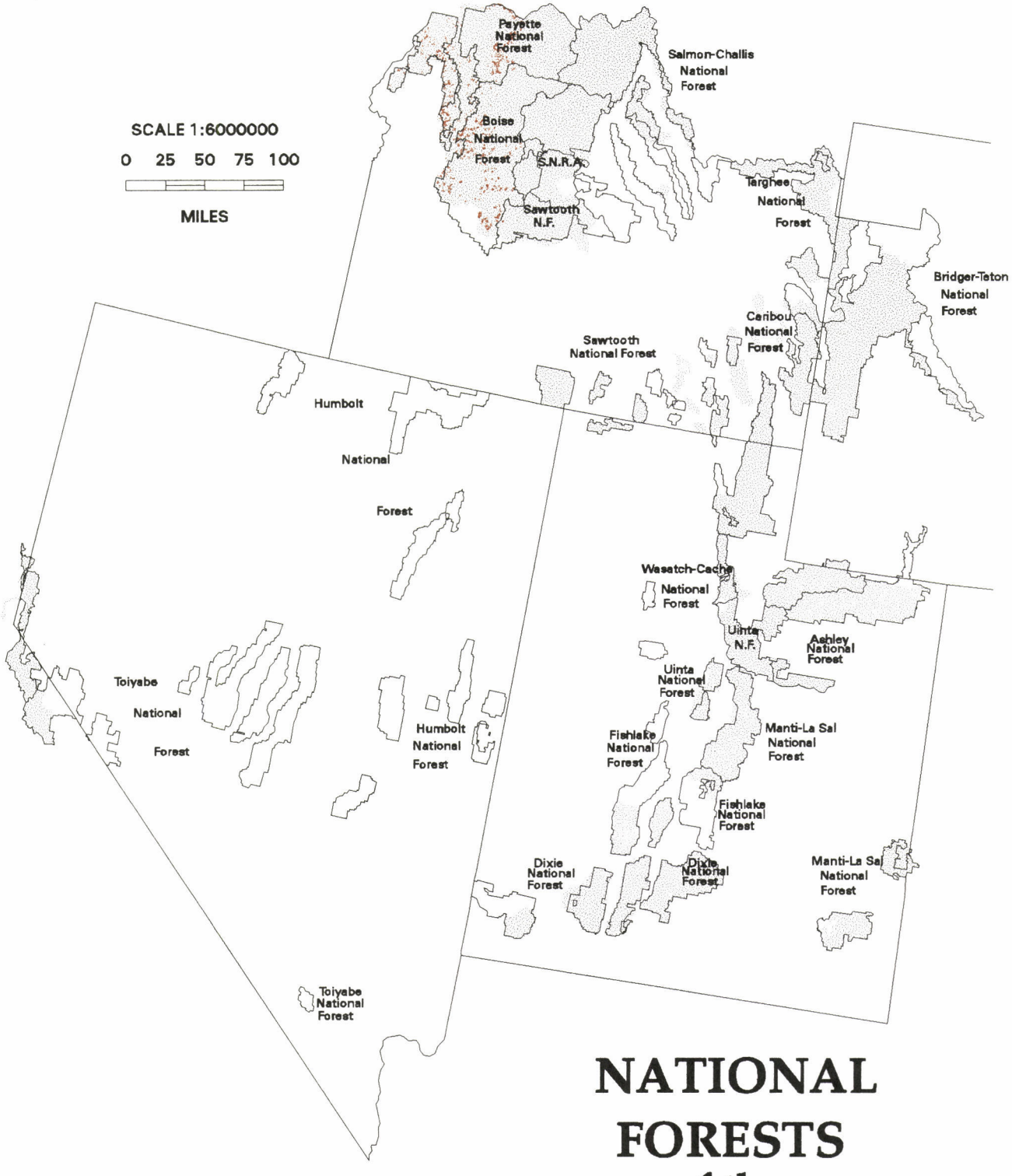
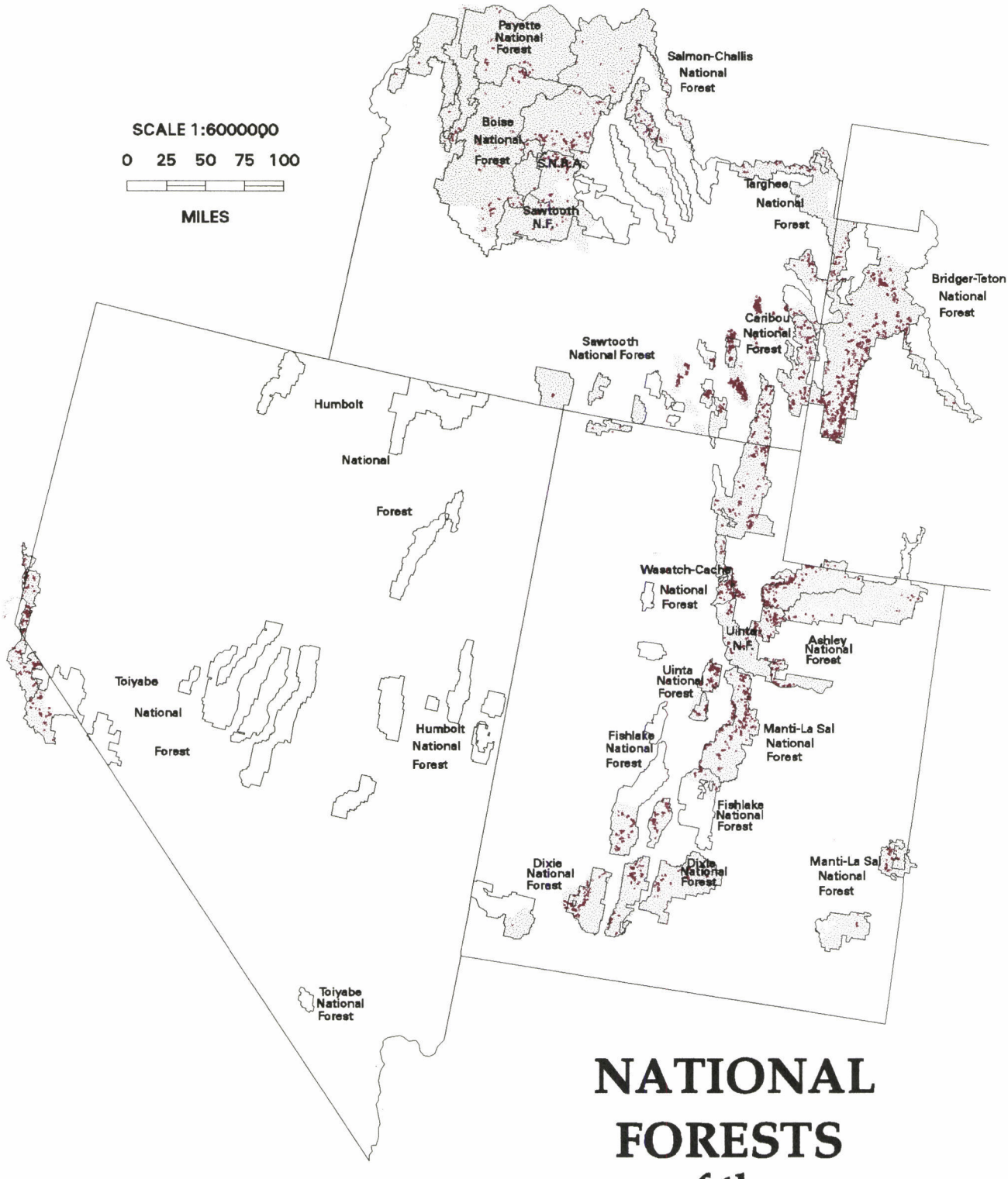


FIGURE 6. *Tree mortality associated with western pine beetle and Ips beetle in Region 4 - 1996 aerial detection surveys.*



NATIONAL FORESTS of the INTERMOUNTAIN REGION

FIGURE 7. *Tree mortality associated with fir engraver beetle and subalpine fir mortality complex in Region 4 - 1996 aerial detection surveys.*



SPECIAL PROJECT UPDATE

Alternatives to Methyl Bromide Fumigation Final seedling measurements were conducted in 1996. The project is intended to evaluate the efficacy of different cultural regimes to reduce the impacts of pests on conifer seedlings because of the impending loss of registration of the popular soil fumigant methyl bromide. An interim report is being prepared. Contact: J. Hoffman.

Fire Survival Plots In 1996, fire survival plots installed in 1995 in six areas burned during the 1994 wildfires on the Payette National Forest were revisited. These areas were selected because they represented underburn conditions in Douglas-fir, grand fir, and subalpine fir habitat types. The objective of this study is to develop criteria which would accurately classify trees expected to die as a result of fire injury. These plots will be monitored through 1998. Contact: J. Weatherby.

Simulated Successional Pathways for a Grand Fir Habitat Type Prototype simulated successional pathways comparing an intensive vegetation management prescription with a pathway in the absence of harvest or prescribed burning for a grand fir habitat type are being developed by FHP and personnel from the Payette National Forest. This project takes stand exam data from a representative stand of trees and projects the stand forward for 100 years using the Forest Vegetation Simulator. The effects of insects and fire are simulated. A draft has been prepared and is being evaluated by potential users. Contact: J. Weatherby.

Permanent Plots to Validate Forest Disease Models This is an ongoing project to establish permanent plots to aid in the validation of disease models including the dwarf mistletoe model, the western root disease model, as well as models for comandra blister rust and limb rust. In 1996, we installed four new plots, remeasured seven existing plots, and checked for mortality on ten existing plots. These plots were installed in forests containing ponderosa pine and Douglas-fir dwarf mistletoes. We also remeasured a series of 16 permanent plots in ponderosa pine infected with limb rust. The re-measurement data are currently being incorporated into the Pest Trend/Impact Plot System (PTIPS). Contact: J. Guyon.

Biological Controls for Noxious Weed Management This project involves coordination and cooperation with George Markin from the Agricultural Research Service (ARS). It includes the distribution of biological control agents, selection of release sites, and installation of long-term monitoring plots to study the impacts on target, as well as non-target vegetative species. Contact: T. Barbouletos or J. Weatherby.

Rush Skeletonweed Research This multi-year project involves coordination and cooperation with George Markin from the ARS. Plots will be installed in 1997 to gather baseline data on the effects of previously released biological control agents on skeletonweed and associated vegetation. Additional studies on new control agents are being conducted with the objective of having four to five new agents available within the next five years. Contact: T. Barbouletos or J. Weatherby.

Development and Flight Distance of Douglas-fir Beetles from a Natural and Synthetic Pheromone Induced Infestation Analysis continues of an investigation conducted in 1996 on the Weiser RD, Payette National Forest, to determine if differences exist in Douglas-fir beetle brood development and adult dispersal where infestations are initiated using synthetic pheromone baits as compared to a naturally occurring infestation. Preliminary results indicate that a lesser proportion of the stem is infested and attack occurs lower on the stem where synthetic baits are employed. With continued analysis, we will also generate better ideas regarding placement of synthetic baits to manipulate infestations. Contact: R. Thier.

Thinning Second Growth Ponderosa Pine as a Management Strategy for Western Pine Beetle Evaluation of an investigation on the Idaho City RD, Boise National Forest, continues to determine if differences in tree mortality exist among stands of second growth ponderosa pine thinned to two densities and an unthinned check stand in the presence of western pine beetle infestation. Permanent plots where all trees are inventoried and stem-mapped will permit the long-term monitoring of both tree growth and beetle dynamics. Contact: R. Thier.

Aerial Application of a Rust Fungus to Reduce the Spread of Dyers Woad This is a cooperative project with Dr. Sherm Thomson, Utah State University. The objectives are: 1) to test various concentration of woad rust spores in different carrying mediums (wet or dry) for viability, mixing characteristics, and dosage rates; 2) to develop a delivery system capable of scattering rust spores over large areas at effective concentrations; and 3) to evaluate the effects of rust in reducing woad populations over time. Contact: J. Anhold, or J. Guyon.

White Pine Blister Rust Survey of the Intermountain Region A three-year study was initiated in 1995 to investigate the current distribution of white pine blister rust in the Intermountain Region. Whitebark, limber, and bristlecone pines are hosts to the disease. Overall, blister rust incidence is widespread in southern Idaho and western Wyoming. It was not found in northern Nevada or northern Utah. Intensity is generally low, however, concentrations of high blister rust intensity were found in most surveyed stands on the Payette and Targhee National Forests. A preliminary report is being prepared. Contact: J. Hoffman.

Evaluation of a Color Infrared Digital Camera System for Forest Health Protection Activities In a cooperative project conducted by the Boise Field Office; the Forest Health Enterprise Team; and the Remote Sensing Application Center; a color infrared digital camera system was evaluated for use in forest health protection applications. The project was supported in part by the Eastman Kodak company. Aerial images were acquired over areas of known forest pest activity and wildfire damage. Digital images were compared to visual observations and to small and medium format natural color photography. Significant enhancement in identification and quantification of pest activity was recorded with forest pests which display low signature-to-background contrast. Results indicate that the camera system can be successfully used to supplement existing operational remote sensing techniques currently used for monitoring and quantifying forest pest activity, and mapping wildfire damage. Contact: A. Knapp

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☆ U.S. GOVERNMENT PRINTING OFFICE: 1997 - 573-068 / 28031 REGION NO. 8

30.03.400.02/96
revised/reprint 1997